Visualization of Magnetization Switching in a Misaligned Iron Nanopillar

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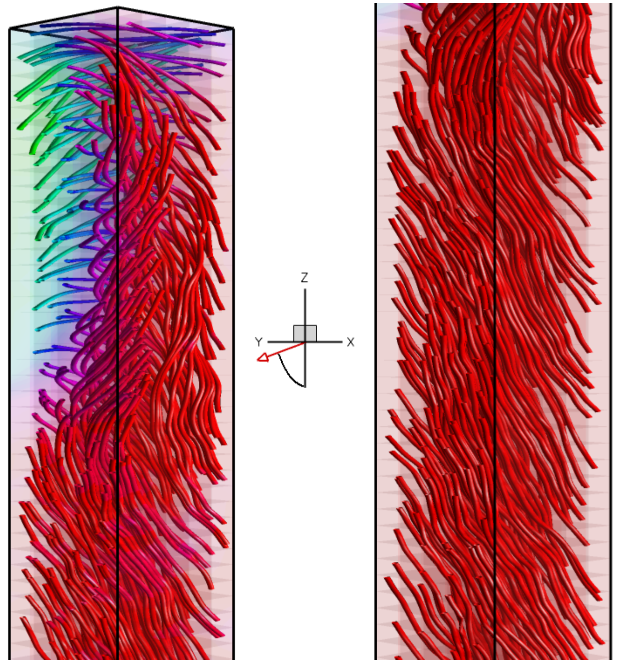
Magnetic nanoparticles are promising materials for ultra-high density magnetic recording media and magnetic RAM. Here we show a visualization of the internal magnetic flux lines in a simulated 9 nm x 9 nm x 150 nm Fe nanopillar, modeled on particles produced experimentally at Florida State University. The simulations use a stochastic differential equation (Landau-Lifshitz-Gilbert equation) for the local magnetization, which includes exchange and magnetostatic interactions, anisotropy, and random thermal fluctuations.



Magnetic flux lines in an Fe nanopillar in an applied magnetic field that makes 75° with the long axis (red arrow in the middle). The pillar is in the metastable state, with most of its spins aligned antiparallel to the z-component of the applied field. Green: stable direction. Red: metastable direction. Left: top of pillar. Right: middle of pillar.

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Education:
Four high school students, **six** undergraduates (Joyce Barksdale, Katrina Kennebrew, James Nail, Roderick Smith, Shannon Wheeler, and Barry Youngblood), **four** graduate students (Terrance Dubreus, Sam Hill Thompson, Poonam Verma, and Jeremy Yancey), and **four** postdocs (Alice Kolakowska, Kyungwha Park, Daniel Robb, Steven Stinnett) were partially funded by this grant. Underrepresented junior researchers supported: **ten** women and **three** African-Americans.

International:
One female professor from Venezuela spent summers at MSU and FSU.

The four high school students pictured spent part of their summer of 2004 working on physical models of small-world nanomaterials at Mississippi State University.